SOP 19 - Temperature Extremes

A. Designers of new experiments or operations should evaluate risks presented by high and low temperatures:

1. Changes in strength of materials that are exposed to temperature extremes or to widely fluctuating temperatures.

2. Embrittlement of materials operating at temperature extremes.

3. Freezing or thawing of process chemicals which may unexpectedly clog or open flow lines, relief systems, or valves.

4. Changes in volume of process fluids upon contact with rapid changes of temperature (i.e., supercritical fluids that rapidly expand upon exposure to atmospheric temperature and pressure).

5. Exposures for explosion or fire involving chemicals which are used at temperature extremes.

B. Experiments or processes operating at temperature extremes shall be adequately isolated or insulated to prevent human contact.

C. Process equipment with may fail due to temperature extremes shall be located such that resulting spills flow into protected appropriate locations.

1. Drying Ovens

a. Do not use drying ovens to dry chemicals of moderate or greater volatility or chemicals that may pose an acute or chronic health hazard unless the oven is properly vented to outside the laboratory.

b. Rinse in distilled water, prior to placing in a drying oven, glassware that has been washed in organic solvent.

c. Verify that the heating elements and temperature controls of drying ovens are physically separated from the interior atmosphere of the oven.

d. Bimetallic strip thermometers are preferable to mercury thermometers for measuring the temperature of drying ovens.

D. Heating Devices

1. Equip electrical heating devices with temperature sensing devices to deactivate the heater if its temperature exceeds a preset limit.

E. Laboratory Hot Plates

a. Insure that laboratory hot plates have electrically insulated heating elements and non-sparking switches.

b. Maintain the thermostat in proper operating condition to insure that temperature control is preserved.

2. Heating Mantles

a. Operate heating mantles at proper line voltage to prevent overheating and damage to electrical insulation.

b. Insure that metal clad heating mantles are electrically grounded.

3. Oil Baths

a. Equip oil baths with temperature sensing devices to prevent the oil from reaching flash point.

b. Use heated oil in metal pans or heavy walled porcelain dishes; glassware can break.

c. Mount oil baths on stable horizontal surfaces.

d. Position the oil bath to reduce the possibility of water or volatile substances falling into the hot bath.

4. Air Baths

a. Construct air baths so that the heating element is completely enclosed.

b. Wrap glass vessels with heat resistant tape so that, if the vessel is accidentally broken, the glass will be retained and the bare heating element covered.

c. Heat Guns should not be used where flammable vapors may be present, because they usually have exposed heating elements and sparking switches.

5. Refrigerators

a. Post prominent signs on refrigerators containing toxic, radioactive, or flammable materials.

b. The interior atmosphere of such refrigerators may contain hazardous concentrations of vapors.

c. Do not place your face inside a refrigerator when looking for a chemical.

d. Do not place uncapped containers of chemicals inside laboratory refrigerators.

e. Minimize the length of time that highly flammable or highly toxic chemicals are stored in a refrigerator.

f. Locate laboratory refrigerators against fire-resistant walls.